



Revision A 02/03/98

ISS Payload Mission Evaluation Request

Date of Request: 8 Aug 97

Revision of Previous Submittal

Yes ☐

RETURN TO:

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FROM:

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Program Manager: Robert McCoy, PhD.
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Form Completed by:

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**** Note: If Payload is Multi-rack Facility, please complete a Payload Mission Evaluation Request for each rack**

Payload Title Thermospheric Temperature and Nitric Oxide Spectrograph

Acronym TtANOS **Discipline** DoD

Payload Type Unpressurized **Funding Approved** Yes ☒

(Pressurized/Unpressurized)

Special Agreement Yes ☒

If Yes, check type Commercial ☐ International ☐ Other ☒ Explain: Sponsored by DoD Space Test Program

Technical Point of Contact

Name Dr. McClintock; see above Telephone
Organization Fax
Address E-mail
City, State Zip Code

Payload Purpose/Objectives (A brief statement of the primary purpose and objectives of the payload.): To resolve certain questions regarding ionospheric photochemistry, and to demonstrate new techniques of remote sensing in the D and E regions of the ionosphere.

Description of Hardware (Brief description of primary and associated hardware and critical physical interfaces.): 1. One Ultraviolet Spectrograph; 2. Five XUV Photometers. Power, data interfaces required.

Payload Operation (Brief description of how the payload will be operated. Identify any other payloads that need to be co-manifested, or available on orbit, to support this payload's operation.): Autonomous operation from laptop computer. Soft x-ray photometer requires sun view once/day. Although continuous or even daily ops not needed, when operating needs several orbits on ops day. At least one year required. Total 230 Mbits data downlinked on ops day, but realtime not required.

Payload Readiness

Requested Launch Date UF-4, Jan 02

Existing Hardware From Previous Flights? Describe Both spectrograph and photometers are based on previously flown hardware.

Preliminary Design Review Date TBD

Critical Design Review Date TBD

Hardware Turnover Date TBD; NOTE: Hardware can be ready in 90 days from "go".

Payload of Opportunity (i.e., On Standby) Yes ☐ No ☐

Hardware Transportation Requirements

UP (Ascent)

| Requested Flight (# or date) | Hardware Item (Name) | Mass (kg) | Volume (m3) | Carrier, if known (e.g. Rack, Middeck Locker) | Location, if known (e.g. Cargo Bay, MPLM) | Additional Information |
|------------------------------|----------------------|-----------|-------------|---|---|------------------------|
| UF4, 01/02 | UV Spectrograph | 28 | .05 | Unknown | Unknown | 64cmX36cm X21cm |
| UF4, 1/02 UF4, 10/02 | XUV Photometers | 3.5 | .001 | Unknown | Unknown | 11cmX11cm X11cm |
| | | | | Unknown | Unknown | |
| | | | | Unknown | Unknown | |
| | | | | Unknown | Unknown | |

DOWN (Descent)

| Requested Flight (# or date) | Hardware Item (Name) | Mass (kg) | Volume (m3) | Carrier, if known (e.g. Rack, Middeck Locker) | Location, if known (e.g. Cargo Bay, MPLM) | Additional Information |
|------------------------------|----------------------|-----------|-------------|---|---|------------------------|
| Post-01/04 | UV Spectrograph | 28 | .05 | Unknown | Unknown | 64cmX36cm X21cm |
| Post-01/04 | XUV Photometers | 3.5 | .001 | Unknown | Unknown | 11cmX11cm X11cm |
| | | | | Unknown | Unknown | |
| | | | | Unknown | Unknown | |
| | | | | Unknown | Unknown | |

Power Requirements

Ascent Power (kw) None

Descent Power (kw) None

Keep Alive Power (on-orbit, minimum power during off-nominal conditions necessary to prevent loss of experiment, kw) None

Auxiliary Power Required Between Runs (on-orbit, kw) None

Thermal Requirements

Air Cooling Ascent (kw) None Descent (kw) None

Describe

On-orbit Cooling (payload operational temperature in °C): Survival: -30 to +55; Operations: -10 to +30

Late Installation/Early Retrieval RequirementsLate Installation/Service Yes ☐

If yes, Launch minus "x" hours (hours) No

Describe

Installation Duration (mins)

Early Payload Removal Yes ☐

If Yes, Landing plus "x" hours (hours) No

Describe

Removal Duration (mins)

Standard On-Orbit Run (Operational Cycle) Requirements (Based on "average" or "standard" operational cycle. These requirements in conjunction with on-orbit "per run" resource requirements are used to estimate total payload resource needs.)Continuous Operations Yes ☐ Explain

"Average" or "Standard" Run Duration (hours) Approx 3.6 hrs (six consec. orbits X 36 min pure daylight/orbit)

Run Frequency (runs/year) Approx 180 (one run every other day)

Total Runs Required Before Payload Returns (#) 180

Minimum Time Between Runs (hours) No absolute minimum, but assume one run per day max.

Special Run Scheduling Requirements Explain X-ray photometer must view sun once per ops day. All orbits of a run must be consecutive. Ops conducted during pure daylight portions of orbits (approx 40%, or 36 minutes per orbit). Seasonal variations in data are critical.

Per Run On-Orbit Operations Resources Requirements

| Per Run Resources | Units | Peak Requirement | | Off-Peak "Average" or "Standard" Requirement | |
|-------------------------------------|-----------|----------------------|------------------|--|------------------|
| | | Quantity (see units) | Duration (hours) | Quantity (see units) | Duration (hours) |
| Power | kilowatts | .008 | 3.6 | .008 | 3.6 |
| Heat Rejection | kilowatts | N/A | | | |
| Data Uplink | Mb/s | .128 | .1 | .128 | .1 |
| Data Downlink | Mb/s | .256 | .25 | .256 | .25 |
| Analog Video Uplink | Mb/s | N/A | | | |
| Analog Video Downlink | Mb/s | N/A | | | |
| Crew, Primary | # persons | 1 | .08 | 1 | .08 |
| Crew, Secondary (e.g. crew subject) | # persons | N/A | | | |

Per Run Resupply Usage & Product Generation

| Storage Type | Resupply | | Product | |
|---------------------|-----------|--------------------------|-----------|--------------------------|
| | Mass (kg) | Volume (m ³) | Mass (kg) | Volume (m ³) |
| Passive | N/A | N/A | N/A | N/A |
| Waste | N/A | N/A | N/A | N/A |
| +4° C Refrigerator | N/A | | | |
| -20° C Freezer | N/A | | | |
| -80° C Freezer | N/A | | | |
| -183° C Cryofreezer | N/A | | | |
| Incubator °C N/A | N/A | | | |

Per Run Consumable Requirements

| Per-Run ISS provided Consumables | Volume (m ³ /run) |
|-------------------------------------|------------------------------|
| Gaseous Nitrogen (GN ₂) | N/A |
| Argon (Ar) | N/A |
| Helium (He) | N/A |
| Carbon Dioxide (CO ₂) | N/A |
| Potable Water | N/A |

Microgravity Requirements

Active Rack Isolation System (ARIS) Required Yes ☐

Explain N/A

Steady-State Microgravity Level Required N/A

Laptop Computer

Do you need a Laptop Computer to interface with your payload? Yes ☒

Explain The instruments are designed to operate autonomously from a laptop computer ~~such as a Macintosh Power Book.~~

External Requirements

Location On-Orbit: EXPRESS Pallet ☒ Truss Site ☐ Exposed Facility ☐

Other ☐ Explain

External Deployed Dimensions (LxWxH) (m) L 0.6 W 0.6 H 0.6

External Packaged Dimensions (LxWxH) (m) L 0.6 W 0.6 H 0.6

Viewing Direction Nadir-mounted; Aft, Earth-limb and Sun viewing

EVA Required (Explain)

Special Servicing Required

Payload Support Equipment Check required equipment:

| | | | | | | | |
|--------------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------------|--------------------------|--------------------------------|--------------------------|
| +4 C ⁰ Refrigerator | <input type="checkbox"/> | Camera, Still | <input type="checkbox"/> | Microgravity Sciences Glovebox | <input type="checkbox"/> | Microscope, Compound | <input type="checkbox"/> |
| -20 C ⁰ Freezer | <input type="checkbox"/> | Camera, Standard Video | <input type="checkbox"/> | Life Sciences Glovebox | <input type="checkbox"/> | Microscope, Dissecting | <input type="checkbox"/> |
| -80 C ⁰ Freezer | <input type="checkbox"/> | Camera, High Resolution Video | <input type="checkbox"/> | Portable Glovebox | <input type="checkbox"/> | Mass Measuring Device, Small | <input type="checkbox"/> |
| Freezer, Cryogenic Storage | <input type="checkbox"/> | Camera Locker | <input type="checkbox"/> | Incubator | <input type="checkbox"/> | Mass Measuring Device, Micro | <input type="checkbox"/> |
| Freezer, Quick/Snap Cryogenic | <input type="checkbox"/> | General Purpose Hand Tools | <input type="checkbox"/> | Specimen Service System | <input type="checkbox"/> | Digital Multimeter | <input type="checkbox"/> |
| Refrigerated Centrifuge | <input type="checkbox"/> | Restraints and Mobility Aids | <input type="checkbox"/> | Cleaning Equipment | <input type="checkbox"/> | Digital Recording Oscilloscope | <input type="checkbox"/> |
| Battery Charger | <input type="checkbox"/> | Passive Dosimeter Reader/Annealer | <input type="checkbox"/> | Housekeeping Equipment | <input type="checkbox"/> | pH Meter/Ion Specific Analyzer | <input type="checkbox"/> |
| DC Power Supply | <input type="checkbox"/> | | | | | Function/Sweep Generator | <input type="checkbox"/> |
| | | | | | | | |

Training

Average Duration of Training Sessions (hours) 8

Frequency of Training

| Type of Training | Number of Sessions | Fidelity of Training Hardware | | |
|---------------------------|--------------------|-------------------------------|--------------------------|--------------------------|
| | | Flight Hardware | Mockup | Engineering Hardware |
| Advanced at Payload Site | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Advanced at JSC | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Increment at Payload Site | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Increment at JSC | 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Refresher | 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Additional Requirements

Vacuum Yes ☐ Waste Gas Vent Yes ☐ Observation Window Yes ☐

Other N/A

Special Services (List any anticipated services required): None

Additional Information: N/A